

MOISTURE CONTENT OF HOT MIX ASPHALT (HMA) BY OVEN METHOD FOP FOR AASHTO T 329 (07)

Scope

This procedure covers the determination of moisture content of HMA in accordance with AASHTO T 329.

Summary

A test sample of HMA is dried in an oven. The moisture content is calculated by one of two methods depending upon agency standards.

- When asphalt binder content is reported as a percent of the initial mass of HMA, moisture content is calculated and reported as a percent of the initial, moist mass of mix.
- When asphalt binder content is reported as a percent of the mass of aggregate, moisture content is calculated and reported as a percent of the final, dry mass of mix.

Apparatus

- Balance or scale: 2 kg capacity, readable to 0.1 g conforming to AASHTO M 231.
- Forced Draft, Ventilated, or Convection Oven: Capable of maintaining the temperature surrounding the sample at $163 \pm 14^{\circ}\text{C}$ ($325 \pm 25^{\circ}\text{F}$).
- Sample Container: Clean, dry, not affected by heat and of sufficient size to contain a test sample without danger of spilling.
- Thermometer or other suitable device with a temperature range of $10\text{-}260^{\circ}\text{C}$ ($50\text{-}500^{\circ}\text{F}$).

Sample

The test sample shall be obtained in accordance with AASHTO T 168, and reduced in accordance with WAQTC TM 5. The size of the test sample shall be a minimum of 1000 g.

Procedure

1. Preheat the oven to a minimum of 105°C (221°F) but, do not exceed the Job Mix Formula (JMF) mixing temperature.

Note 1: For repeatability between laboratories the preferred practice is to dry the sample at no less than 9°C (15°F) below the JMF mixing temperature.

2. Determine and record the mass of the sample container including release media to the nearest 0.1 g.
3. Place the test sample in the sample container.
4. Determine and record the temperature of the test sample.
5. Determine and record the total mass of the sample container and test sample to the nearest 0.1 g.

6. Calculate the initial, moist mass (M_i) of the test sample by subtracting the mass of the sample container determined in Step 2 from total mass of the sample container and the test sample determined in Step 5.
7. The test sample shall be initially dried for 90 ± 5 minutes, and its mass determined. Then, at 30 ± 5 min intervals until constant mass is achieved.

Note 1: Constant mass shall be defined as the mass at which further drying does not alter the mass by more than 0.05 percent.

8. Cool the sample container and test sample to $\pm 9^\circ\text{C}$ (15°F) of the temperature determined in Step 4.

9. Determine and record the total mass of the sample container and test sample to the nearest 0.1 g.

Note 2: Do not attempt to remove the test sample from the sample container for the purposes of determining mass.

10. Calculate the final, dry mass (M_f) of the test sample by subtracting the mass of the sample container determined in Step 2 from the total mass of the sample container and the test sample determined in Step 9.

Note 3: Moisture content and the number of samples in the oven will affect the rate of drying at any given time. Placing wet samples in the oven with nearly dry samples could affect the drying process.

Calculations

Constant Mass:

Calculate constant mass using the following formula:

$$\frac{M_p - M_n}{M_p} \times 100 = \%Change$$

Where: M_p = previous mass measurement
 M_n = new mass measurement

Example:

Mass of container: 232.6 g

Mass of container after first drying cycle: 1361.8 g

Mass, M_p , of possibly dry sample: $1361.8 \text{ g} - 232.6 \text{ g} = 1129.2 \text{ g}$

Mass of container and dry sample after second drying cycle: 1360.4 g

Mass, M_n , of dry sample: $1360.4 \text{ g} - 232.6 \text{ g} = 1127.8 \text{ g}$

$$\frac{1129.2 - 1127.8}{1129.2} \times 100 = 0.12\%$$

0.12% is not less than 0.05% so continue drying

Mass of container and dry sample after third drying cycle: 1359.9 g
 Mass, M_n , of dry sample: $1359.9\text{g} - 232.6\text{g} = 1127.3\text{g}$

$$0.04\% = \frac{1127.8 - 1127.3}{1127.8} \times 100$$

0.04% is less than 0.05% constant mass has been reached

Moisture Content:

Calculate the moisture content, as a percent, using one of the following two formulas.

Percent of Initial, Moist Mass:

$$\frac{M_i - M_f}{M_i} \times 100 = \text{Moisture Content}$$

Where: M_i = initial, moist mass
 M_f = final, dry mass

Example:

$M_i = 1134.9\text{ g}$
 $M_f = 1127.3\text{ g}$

$$\text{Moisture Content} = \frac{1134.9\text{ g} - 1127.3\text{ g}}{1134.9\text{ g}} \times 100 = 0.670, \text{ say } 0.67\%$$

Percent of Final, Dry Mass:

$$\frac{M_i - M_f}{M_f} \times 100 = \text{Moisture Content}$$

Where: M_i = initial, moist mass
 M_f = final, dry mass

Example:

$M_i = 1134.9\text{ g}$
 $M_f = 1127.3\text{ g}$

$$\text{Moisture Content} = \frac{1134.9\text{ g} - 1127.3\text{ g}}{1127.3\text{ g}} \times 100 = 0.674, \text{ say } 0.67\%$$

Report

Results shall be reported on standard forms approved for use by the agency. Report the moisture content to 0.01 percent.

PERFORMANCE EXAM CHECKLIST

**MOISTURE CONTENT OF HOT MIX ASPHALT BY OVEN METHOD
FOP FOR AASHTO T 329**

Participant Name _____ Exam Date _____

Record the symbols "P" for passing or "F" for failing on each step of the checklist.

Procedure Element	Trial 1	Trial 2
1. Mass of clean dry container including release media determined to 0.1 g?	_____	_____
2. Representative sample obtained; 1000 g minimum?	_____	_____
3. Initial temperature taken and recorded?	_____	_____
4. Mass of sample determined to 0.1 g?	_____	_____
5. Sample placed in drying oven for 90 minutes?	_____	_____
6. Sample dried not exceeding the JMF mixing temp?	_____	_____
7. Constant mass checked?	_____	_____
8. Sample and container cooled to ±9°C (15°F) of the initial temperature before final mass determined to 0.1 g?	_____	_____
9. Calculation of moisture content performed correctly to 0.01%?	_____	_____

% Moisture as percent of Dry Mass

$$\frac{M_i - M_f}{M_f} \times 100$$

% Moisture as percent of Wet Mass

$$\frac{M_i - M_f}{M_i} \times 100$$

Comments: First attempt: Pass Fail Second attempt: Pass Fail

Examiner Signature _____ WAQTC #: _____